UMASS EXTENSION

Vegetable Notes

For Vegetable Farmers in Massachusetts

Volume 26, Number 13 July 10, 2014

In this issue:

Crop conditions

The continued heat and sunshine along with the soaking rains have really pushed things along, and it seems most farms have overcome the season's late start and jumped on the summer treadmill. Main season plantings are mostly complete, and the focus is now on keeping up with quickly growing crops and weeds; bringing in loads of cucumbers, zucchini, and summer squash; digging up carrots, beets and radishes; harvesting leafy greens and lettuces; and getting fall crops in the ground. All this amidst continued high heat and humidity, stay hydrated out there folks! The first sweet corn is ready, the first new potatoes are being dug, squash and melon vines are beginning to run, and garlic tips are dying back as they approach maturity (see article this issue for harvest tips). Some heat-loving pests have also been getting a nudge from the heat, creating aphid explosions, a flush of Japanese and other scarab beetles, and bacterial diseases (which thrive in hot, humid conditions) in tomatoes, onions, peppers and cucurbits. Tropical Storm Arthur brought up to 8 inches of rain, but did not drop as much corn earworm across the region as expected. Overall, crops are looking good and folks are digging in for several hardworking harvest months ahead, providing food to a region that is hungry for local, summery vegetables.

Tis the season for big zucchini harvests (Hadley, MA)

Pest alerts

Cucurbits: Frequent rains and humid weather are highly conducive to development of **Phytophthora blight**. Scout low-lying, wet, fields or fields where the disease has previously occurred. Plow under any areas that are infected, along with a non-infected border area, to slow the spread of this disease. **Squash Vine Borer** moths have been captured and are above threshold (5 adults per trap per week; 1 adult per trap per week when using organic products) in pheromone traps in Hampshire, Worcester, and Franklin Co., MA, Chittenden Co., VT, Hillsborough Co., NH and southern RI. High numbers (69) were trapped again this week in a Chittenden Co. VT field, but no damage or eggs were found. Spinosyns (Entrust SC or Radiant) have shown efficacy if coverage is good. **Powdery mildew** usually arrives this time of year, and develops quickly under hot, dry conditions. Scout early successions of zucchini and summer squash and begin managing this disease as soon as it is observed as it can spread rapidly. No new outbreaks of **Cucurbit downy mildew** have been reported, and the Northeast remains at minimal risk.

Solanaceous crops: In **potato and eggplant,** larvae of the first generation **CPB** are large and feeding heavily where not controlled. In some fields, especially those that were rotated a distance from 2013 potatoes, the CPB population is still below threshold. Potatoes can withstand up to 15% defoliation without yield reduction, but CPB can cause much greater defoliation that that. For small scale growers, treating heavily infested "hot-spots" may be effective. **Pepper Maggot:** Flight usually begins in mid-July. Look for 'sting' marks on cherry peppers and peppers near treelines (see image and look for article next week). **Late blight** has been confirmed in nearby areas of

Pepper maggot 'sting' marks on bell pepper.

Ghost spot on tomato caused by Botrytis
photo: Mollie Klepack, University of Vermont.

European corn borers are moving down and boring into stalks.
photo: Anya Rose, University of Vermont.

New York, Pennsylvania and Long Island. Overnight conditions with heavy dew and frequent heavy rains can be conducive to disease development, even though daytime temperatures are high. If you are still using protectant fungicides or have not started your spray program, now is the time to start, or switch to a late-blight specific material. 'Rescue sprays' are pretty much useless. The Late Blight Decision Support System (DSS) for many MA locations is recommending a 5-7 day spray interval for susceptible varieties following a protectant fungicide such as chlorothalonil or copper hydroxide; longer intervals are recommended for tolerant varieties and where late blight specific fungicides were last sprayed. Get recommendations tailored to your local weather conditions and fungicide program using the MA DSS website here. **Ghost spot** caused by *Botrytis cinerea* (see image) is appearing on greenhouse tomato fruit with high incidence of foliar botrytis infections.

Beans: **Mexican Bean beetle** adults have been spotted in MA. Scout for eggs and hatching larvae on the undersides of bean leaves and, if observed, consider releasing the biological control organism, *Pediobius foveolatus*.

Table 1. European corn borer and corn earworm trap captures for week ending 7/3/14.

Location	Weekly ECB reported	Weekly CEW reported	Spray Interval for CEW
Western, MA			
Sheffield	0	0	
South Deerfield	1	0	
Amherst	2	0	
Hadley	0	2	*6 days*
Feeding Hills	0	2	*6 days*
Central & Eastern MA			
Spencer	1	0	
Tyngsborough	0	1	
Concord	0	0	
Sharon	1	1	
Leominster	7	-	
Lancaster	0	0	
Seekonk	0	2	*6 days*
Rehoboth	6	2	*6 days*
NH			
Litchfield	1	0	
Hollis	0	0	
Mason	0	1	
Burlington, VT	3	0	

Basil Downy Mildew was confirmed in Massachusetts on basil purchased from a big box store last week. The UMass Vegetable Program is conducting a field trial this summer on efficacy of several copper formulations to control this disease in conventional and organic systems—come see the trial at the UMass Ag Field Day and look for those results to be published this fall.

Sweet Corn: **European Corn Borer** trap counts are low and we are between first and second generation moth flights. However, larvae are still active so keep scouting. If European corn borer is over the 15% threshold, treatment is recommended if the goal is to have 95% to 100% clean corn harvest. As tassels open, release pollen, and dry out, borers move down the plant and bore into stalks near leaf nodes or into ears with fresh silk. Scout between the ear and the stalk, looking for entrance holes and frass. In **VT:** 40% of a block in fresh silk stage had ECB borer holes in the stalks (see picture). Record scouting data in your Sweet Corn IPM Field Guide and use the full guide for ID and scouting tips. **Corn earworm** remains low in the region, below threshold or just at the threshold for sprays at 6 day intervals. **Sap Beetle** A crop consultant in Hadley, MA reported that sap beetles were a problem in early corn last year (see article), and this year he has captured them in spotted wing drosophila traps.

General: **Potato Leafhopper** nymphs were found on a variety of red **potato** in Plymouth, MA showing some hopper burn. Scout your susceptible varieties first (including red potatoes) and treat at threshold of 1 adult per plant or 15 nymphs per 50 leaves. Numbers in emerging **beans** are also reaching threshold of 2 adults per row foot. Treat pre-bloom plants at 5 adults per row ft or 1 nymph per leaflet. **Spider mites** have been seen in field cucumbers in Burlington, VT. Scout high-tunnel and greenhouse tomatoes and cucumbers, and field crops if hot weather continues. **Aphids,** including **cabbage aphid**, are building up in some fields. **Melon aphid** populations also build up in high heat. Chemical control

may be necessary if natural enemies are not effective. **Thrips** populations have built up rapidly in high heat on onion, brassicas and even cucumber. Scout at least weekly. Treat onions if there is 1 thrip/leaf.

GARLIC HARVEST, CURING AND STORAGE

Many farmers are beginning to think about harvesting garlic, a big task that usually occurs around mid-late July. Timing the harvest can be tricky—heads should be left in the ground as long as possible to attain maximum bulb size (which doubles in the last stage of growth), but not so long that the cloves begin to separate, as overripe bulbs sell and store poorly. Harvest when leaves begin to turn yellow, but when about 60% are still green. Check bulbs by cutting through the head sideways to see how well developed the cloves are. Cloves should fill the wrappers - if they seem a little loose, the garlic has a little ways to grow. A little of the very outer wrapper may have started to discolor at this point. Harvest before the bulbs pop, which can happen relatively quickly, especially in a wet year. Remember that it is better to harvest too early than too late.

Use hand tools to loosen soil under the bulbs or a mechanical harvester to undercut the bed. Pulling bulbs out when they are tight in the ground can open wounds at the stem-bulb junction and allow for fungal infections. Fresh bulbs bruise easily and these wounds can also encourage infection. Don't knock off dirt by banging bulbs against boots, shovels, or buckets – shake or rub gently, and leave the rest to dry out during curing.

Curing is important for successful bulb storage and finding the ideal conditions for curing can also be a challenge. Curing in the field runs the risk of sunscald, while poorly ventilated barns can result in loss from disease. Avoid high temperatures (over 90°F) and bright sunlight. Rapid curing can be achieved by placing bulbs roots up on 1" wire mesh in a hoophouse covered with a shade cloth, and with the sides and ends open. A well-ventilated barn will also work, but be sure that bulbs are hung with adequate air circulation or on open racks up off the floor. Curing takes 10-14 days. Stems may be cut before or after curing. Curing is complete when the outer skins are dry and crispy, the neck is constricted, and the center of the cut stem is hard.

Storing Bulbs. After curing, garlic can be kept in good condition for 1 to 2 months at ambient temperatures of 68 to 86 °F under low relative humidity (< 75%). However, under these conditions, bulbs will eventually become soft, spongy and shriveled due to water loss. For long-term storage, garlic is best maintained at temperatures of 30 to 32°F with low RH (60 to 70%). Good airflow throughout storage containers is necessary to prevent any moisture accumulation. Under these conditions, well-cured garlic can be stored for 6-7 months. Common storage using cool night air may be adequate for 3-4 months, but it is important to select a place with low relative humidity and good air flow. As with onions, relative humidity needs to be lower than for most vegetables because high humidity causes root and mold growth; on the other hand, if it is too dry the bulbs will dry out.

Storing Seed. Garlic bulbs that are to be used as seed for fall planting of next years' crop should be stored at 50 °F and at relative humidity of 65-70%. Garlic cloves break dormancy most rapidly between 40 to 64 °F, hence prolonged storage at this temperature range should be avoided. Storage of planting stock at temperatures below 40°F results in rough bulbs, side-shoot sprouting (witch's-brooms) and early maturity, while storage above 65°F results in delayed sprouting and late maturity.

Garlic cloves used for seed should be of the highest quality, with no disease infections, as these can be spread to new fields and to next years' crop. Be on the lookout for garlic blight nematode which may have been distributed around New England on infested seed garlic. This nematode, which is also known as a bulb and stem nematode, causes bloated, twisted, swollen leaves, and distorted and cracked bulbs with dark rings. Infestation with this nematode can weaken plants, causing them to be susceptible to secondary infections. The UMass Plant Disease Diagnostic Lab can make a positive identification; call 413-545-3209 to submit a sample.

-R Hazzard. Resources: New England Vegetable Mgt Guide, Oregon State, ATTRA, Wishingstone Farm, Astarte Farm, USDA Handbook 66. Last Edited 2014.

BACTERIAL DISEASES OF TOMATOS

Three bacterial diseases commonly affect tomato crops: Bacterial Spot (*Xanthomonas campestris pv. vesicatora)*, Bacterial Speck (*Pseudomonas syringae pv tomato*), and Bacterial Canker (*Clavibacter michiganensis pv michiganensis*). Toma-

to pith necrosis is a less common bacterial disease that can be confused with bacterial canker. These diseases can affect foliage, fruit, and stems and distinguishing between them can be difficult. In general, bacteria are commonly introduced via overwintered weeds, crop debris, or by seed. Secondary spread of bacterial cells occurs by rain splash and movement of workers or equipment through the field. Management of bacterial diseases is difficult once they are established, so using good sanitation such as buying clean seed, hot water treating seeds, maintaining good weed control, and rotating crops are essential to preventing disease onset.

Bacterial Spot *(Xanthomonas campestris pv. vesicatora)* (*Xcv*)

Bacterial speck (*Pseudomonas syringae pv. tomato*)

Bacterial canker (*Clavibacter michiganensis pv michiganensis*)

Tomato Pith Necrosis *(Pseudomonas corrugata)*

Bacterial spot caused by *Xanthomonas campestris pv. vesicatora* (*Xcv*) is present wherever tomato and peppers are grown. In general, *Xanthomonas* pathovars have narrow host ranges. *Xcv* consists of different strains that vary in their pathogenicity to tomato, pepper, and solanaceous weeds. The bacterium is able to survive on tomato volunteers and can overwinter in diseased plant debris or on tomato stakes. Seed is an important mechanism for survival and dissemination of *Xcv*. Disease development is favored by temperatures between 80˚ and 90˚ F and by heavy rainfall. The bacterium is spread by wind-driven rain, workers, farm machinery, and by aerosols in humid air. It penetrates plant tissues through stomates, wounds created by insects, wind-driven sand, and tools. *Xcv* affects all aboveground plant parts. On leaves, the spots are generally brown, circular, and water-soaked. Bacterial spot lesions do not have concentric zones or a prominent halo. When conditions are optimal for disease development, spots can coalesce to form long, dark streaks. A general yellowing may appear on foliage with many lesions giving the plants a scorched appearance, and the plants may exhibit severe bending and twisting. Only green tomato fruit is susceptible to infection, and lesions are quite distinct, beginning as minute, slightly raised blisters with a halo that resemble the birds-eye spot caused by *Clavibacter michiganense* (bacterial canker). As lesions enlarge, they lose their halo and become brown, raised, and scab-like on ripe fruit. Lesions on ripe pepper fruit may be scab-like or sunken.

Bacterial speck (*Pseudomonas syringae pv. tomato*) causes a fruit spot and foliar blight on tomato only, not pepper and is generally of minor concern. Disease development is favored by low temperatures and high moisture. The pathogen can be seedborne, and may persist in weed species. Secondary disease spread within fields occurs by wind-driven rain, workers, farm machinery, and by aerosols in humid air. Lesions on leaves are round and dark brown to black with a halo that develops with time. Spots may coalesce, killing large areas of tissue. On fruit, small (1/16 inch), dark spots or specks develop with the tissue around them often more intensely green than unaffected areas.

Bacterial canker (*Clavibacter michiganensis pv michiganensis*) is one of the most destructive tomato diseases in Massachusetts. Initial symptoms are the result of primary, systemic, infections. The lower leaves are affected first, exhibiting leaf curling, wilting, yellowing, and shriveling. In advanced stages, the pathogen spreads throughout the plant and causes poor growth, wilt, and plant death. Foliage throughout the canopy wilts, yellows, turns brown, and collapses. Stems can split resulting in open breaks or cankers and stems break easily. Secondary infections occur from rain splash onto foliage, stems, and fruit. Spots occur on green fruit and are very characteristic: white to yellow spots, 3-4 mm with raised brown centers known as “bird’s eye spots”.

Tomato Pith Necrosis is caused by *Pseudomonas corrugata* and other soil-borne species of Pseudomonas. While high tunnels and greenhouses provide ideal conditions for the growth of early season tomatoes, this environment also provides ideal conditions for this emerging disease. Pith necrosis generally occurs on early planted tomatoes growing when night temperatures are cool, the humidity is high, and the plants are growing vigorously because of excessive levels of nitrogen. The disease is also associated with prolonged periods of cloudy, cool weather. Initial symptoms often appear just as the first fruit clusters reach the mature, green stage, and consist of yellowing and wilting of young leaves. Serious infections can result in yellowing and wilting of upper portions of plants, with brown to black lesions on infected stems and petioles. When stems are cut longitudinally, the center of the stem (pith) may

be extensively discolored, hollow, and/or degraded. Stems may be swollen, numerous adventitious roots can form, and infected stems may shrink, crack, or collapse. The epidemiology of this disease is not well understood; it is possible that the bacteria are seed-borne and most certainly survive in the soil in association with infected tomato debris.

Preventive measures to minimize the occurrence of pith necrosis in high tunnels include: adequate ventilation to avoid high humidity levels (especially during cloudy weather), avoiding excessive nitrogen levels to prevent vigorous plant growth, incorporation of crop debris to speed decomposition of residue and associated bacteria, and crop rotation. There is no effective treatment for this disease. Affected plants may recover if environmental conditions improve (warm, sunny weather) but if not, affected plants should be removed from the field to prevent spread of the disease.

Preventing losses to bacterial diseases:

1. Start with certified, disease-free seed or treat seed with hot water, hydrochloric acid, calcium hypochlorite, or other recommended materials. See the fact sheet entitled, Preventing Bacterial Diseases of Vegetables with Hot-water Seed Treatment for further details.

2. Control bacterial populations that may be present on the leaf surface of transplants in the greenhouse. Young transplants may not display symptoms of bacterial diseases. Inspect and remove suspect transplants. Lower the water pressure in irrigation equipment to avoid damaging leaves. Avoid the practice of mowing transplants to regulate transplant height or suckering plants when symptoms are present.(See New England Vegetable Management Guide for more detail.)

3. Plant into a clean field using sterilized stakes. Promptly incorporate crop debris after harvest. Rotate to a non-host crop before returning to tomato and do not allow volunteer tomato or weed hosts to survive.

4. Avoid working in fields when bacterial diseases are present and the fields are wet. Work in infected fields last.

5. In general, bacterial diseases of field crops are difficult to control with pesticides. Copper products are most effective, and the addition of mancozeb products can increase their efficacy. Streptomycin (eg., 45Agri-mycin 17) is an effective product that may be used only in the greenhouse before transplanting to the field. When a significant amount of disease is present, pesticides are usually not effective. Biological disease control products that have shown efficacy in some trials on bacterial diseases in tomato include Actigard or Regalia (both plant defense activators).

-- B. Dicklow and S. B. Scheufele

SAP BEETLES IN SWEET CORN

Sap beetles have generally been thought of as secondary pests of sweet corn, usually associated with damage caused by caterpillars, but on some farms they are a regular and troublesome pest in early sweet corn plantings – even where caterpillar control has been excellent. Early sweet corn varieties tend to have poor tip cover, allowing sap beetle adults to lay eggs near the tip, where tiny larvae burrow into the kernels, and make the ears unmarketable (see photo). Sap beetle adults have already been observed in early corn plantings in MA, so now is the time to be scouting if this pest has been a problem on your farm in past years. Sap beetles can also be pests of strawberry and other fruits, so they tend to be more of a problem on farms that grow both fruit and corn. They also tend to be worse in a hot, dry year.

Sap beetle larva

Life Cycle and Damage. Sap beetles overwinter as adults, in crop residues, hedgerows and woods near previous feeding sites. Early sweet corn silk is an attractive early-season feeding and egg-laying site, especially when fruit hosts are rare. There are several generations per year. The most common sap beetles in corn are the dusky sap beetle (Carpophilus lugubris) is black and plain (3.5-4.5 mm long), and the four-spotted sap beetle (also known as picnic beetle, Glischrochilus quadrisignatus) which is black with four irregular yellow spots (5-6 mm long). The most common species in strawberries is the strawberry sap beetle, *Stelidota geminate.*

Adults are first noticeable about the time that tassels and silk appear. They may also move in closer to harvest, when kernels fill and silks are dried or decaying. They may invade corn borer tunnels or areas with other insect or bird damage, but are also found in corn that is free of caterpillar damage. They lay eggs in silks and the tip of ears. Eggs are milky white

and resemble tiny grains of rice. The larvae are small, pinkish white or creamy colored grubs about ¼ inch long. They may hollow out kernels of the upper half of the ear, making ears unmarketable. Adults may also hide between the layers of the husk. The problem can easily be overlooked until harvest, when adults show up in harvest bins, and larvae are found in the ears.

Monitoring and sprays. Sample for sap beetles when silks begin to wilt, and scout regularly until harvest. Inspect the silk area at the tip and the husks of 50-100 ears across the field, and determine the percent of ears infested with adults, eggs, or larvae. Sprays for other ear pests usually control sap beetles, but if other pests are absent and more than 10% of ears are infested with sap beetles, treat for sap beetles. Sprays in the final 7-10 days before harvest may be needed if sap beetles are present at that time – timing is important. Pyrethroids used to control ECB and CEW will reduce sap beetle, but if populations are high, a combination of pyrethroid and methomyl (Lannate) may provide additional control. Bt hybrids that produce Bt toxin at the cellular level do not protect against sap beetles, so you may need to spray even in the absence of ECB and CEW in those plantings.

Cultural practices. Ears with exposed tips, especially super sweet and Bt varieties, are especially susceptible to infestation. To prevent or reduce damage, select varieties that have good tip cover, use clean cultivation, control ear-infesting caterpillars, and remove or bury decomposing fruit (especially in fall to reduce the size of the overwintering population) on a regular basis. Sanitation is important to prevent successful overwintering and reproduction during the season. Bury corn residue, especially decomposing ears; remove or bury alternate hosts such as rotting tree fruit or discarded vegetables. Burial should be deeper than 10 cm.

--R Hazzard and S. B. Scheufele

CATERPILLARS IN BRASSICA CROPS, PART II

Cabbage Looper

Cabbage looper *(Trichoplusia ni)* usually does not survive the winter in New England and arrives in migratory flights from farther south. Generally populations of cabbage loopers are not high until late-July or August, though some years they are not found at all or earlier flights occur. Adult moths are mottled gray-brown, about 3/4 inch long, with a distinct round silver-white mark on each fore-wing. Since they fly at night, they are rarely seen unless monitored with pheromone traps. If you want to know when moths arrive, use a wing trap baited with *Trichoplusia ni* lure, placed near the canopy. The cabbage looper caterpillar is light green, smooth, with wavy white or light yellow lines down the back and sides, and prolegs at the tip of the abdome. Full-grown larvae reach 1 ½ to 2 inches. Cabbage loopers of any size will raise the middle of their body in a characteristic "loop" shape, as an inch worm would. Eggs are round, light green or yellow, and are laid underneath the foliage. Feeding tends to create ragged, large holes, on both leaves and heads, leaving large pellets of frass behind. Cabbage looper also feeds in many non-brassicas including lettuce, celery, spinach, and chard so when they do arrive, scout those crops as well as brassicas.

Cross striped cabbageworm and feeding damge.

Cross-striped cabbageworm (*Evergestis rimosalis*; Lepidopeta: Pyralidae) has not historically been found in New England but has gradually extended its range northward. We first listed it in the New England Vegetable Management Guide around 2005, because it had become common in Connecticut. By 2012 it was found in Hampshire, Worcester and Norfolk Counties in MA. Its damage is similar to that of other caterpillars but it can be even more damaging if populations are high. One of the major differences between this insect and the other brassica caterpillars is that the eggs are laid in a group, and caterpillars feed in a group on one plant so that it's covered with big holes like buckshot.

Cross-striped cabbageworm (CSC) is closely related to European corn borer, and the adults are similar in shape and coloring – straw-colored with a little purple and crossed by wavy lines. Since it flies at night, you will likely only notice the caterpillars and their damage. The clusters of 3 to 25 eggs are yellow, flattened, and attached to the low-

er leaf surfaces. The caterpillars are light bluish-grey on top and green underneath, with numerous black transverse bands across their backs and a yellow line down each side. Larvae grow to 3/4”-long in 2 to 3 weeks. There are 2-3 generations per year, but generally it’s only in late summer that numbers reach damaging levels. Larvae can produce small holes in leaves until only veins remain, feed in terminal buds and sprouts, or burrow into heads. Plants with larvae are often completely skeletonized because of how many eggs laid in clusters. Adjacent plants may be left undamaged.

For scouting and management, see July 3 2014 issue of Vegetable Notes.

--R. Hazzard and S.B. Scheufele

UPCOMING EVENTS

Vegetable Program Twilight Meetings

August 13th, 2014 4-7 pm
Foppema’s Farm, Northbridge, MA

August 27th, 2014
Brigham Hill Community Farm, Grafton, MA

IPM Field Walks

August 14th, 2014 3:30-6:00 pm
High Meadows Farm, 742 Westminster West Rd., Putney, VT

August 22nd, 2014, 3-5 pm
The Farm School, 488 Moore Hill Road, Athol, MA 01331

UMass Agricultural Field Day

When: Tuesday, July 29, 2014, 10:00am to 4:00pm

Where: UMass Animal and Crop Research Center, 89-91 North River Road, South Deerfield, MA 01373

Come tour the research farm and learn about all of the exciting projects currently underway on a broad range of agricultural topics. Contact Madeline Madin, cdle@umext.umass.edu, 413-545-5221 for more information on this event.

Vegetable Notes. Ruth Hazzard, Katie Campbell-Nelson, Lisa McKeag, Susan Scheufele, co-editors. Vegetable Notes is published weekly from May to September and monthly during the off-season, and includes contributions from the faculty and staff of the UMass Extension Vegetable Program, other universities and USDA agencies, growers, and private IPM consultants. Authors of articles are noted.